AMENDMENTS TO THE SPECIFICATION

Please replace the heading on page 1, before ¶ **[0001]** with the following:

~~FIELD OF THE INVENTION~~ BACKGROUND

Please delete the heading on page 1, between ¶¶ **[0001]-[0002]** as follows:

~~BACKGROUND OF THE INVENTION~~

Please delete the heading on page 1, between ¶¶ **[0002]-[0003]** as follows:

~~SUMMARY OF THE INVENTION~~

Please insert a heading on page 1, between ¶¶ **[0003]-[0004]** as follows:

SUMMARY

Please replace ¶¶ **[0004]-[0005]** with following:

[0004] It ~~is therefore~~ is, therefore, an object of this invention to provide an oil pressure control of a vehicle transmission which enables smooth starts regardless of the shift operation of a driver.

[0005] ~~In order to~~ To achieve the ~~above~~ aforementioned object, this invention provides an oil pressure control device for changing the operating range of a vehicle transmission, the operating range including at least a drive range which advances the vehicle, a reverse range which reverses the vehicle and a stop range which stops the vehicle. The transmission has a forward/reverse change-over part which is provided with a forward clutch which transmits a drive force generated by an engine to the transmission as a drive force which advances the vehicle, and a reverse clutch which transmits a drive force generated by the engine to the transmission as a drive force which reverses the vehicle, wherein only the forward clutch is engaged by oil pressure in the drive range, only the reverse clutch is engaged by oil pressure in the reverse range, and both the forward clutch and reverse clutch are released in the stop range. The transmission further has a speed change part connected to the forward/reverse change-over part.

Please replace ¶ **[0020]-[0021]** as follows:

[0020] A transmission 1 is provided with a forward/reverse change-over part 10, a speed change part 20, an oil pressure adjustment part 30, a controller 40 and a torque converter 50. The transmission 1 slows down the rotation of an engine 60, and transmits it to a drive wheel 70. The power transfer system from the engine 60 to the drive wheel 70 is referred to as a power train. The power train is provided with the ~~with a~~ transmission 1, an idler gear and a differential gear.

[0021] ~~A controller~~ The controller 40 ~~comprises~~ includes: a microcomputer provided with a central processing unit (CPU) ~~which~~ that executes programs, read-only memory (ROM) ~~which~~ that stores programs and data, random access memory (RAM) ~~which~~ that temporarily stores the computation results of the CPU and acquired data, a timer for measuring time, and an input/output interface (I/O interface).

Please replace ¶¶ **[0023]-[0025]** with the following:

[0023] In the following, "clutch pressure" means an oil pressure supplied from the clutch pressure adjusting device 35, i.e., forward clutch pressure or reverse clutch pressure. The clutch pressure adjusting device 35 adjusts the oil pressure (forward clutch pressure, reverse clutch pressure) supplied to the forward clutch 12 and reverse clutch 13 according to a command from the controller 40, and thereby controls the engaging state of the clutch. When the forward clutch 12 or reverse clutch 13 is engaged with the planetary gear 11 from the release state, the clutch pressure adjusting device 35 rapidly supplies (precharges) ~~oil, and~~ oil and, therefore, the oil pressure of the forward/reverse change-over part 10 ~~therefore~~ rises promptly to an initial pressure Pi.

[0024] The operating range of the transmission is selected by a driver via a shift lever 43. The operating range of the transmission includes at least a drive (D) range (shown), a reverse (R) range (shown), a neutral (N) range (shown), and a parking (P) range (not shown). Hereafter, in this specification, the N range and P range may be generally referred to as stop ranges. ~~A shift~~ The shift lever 43 is located in any one of a D range position for selecting the D range, a N range position for selecting the N range, a R range position for selecting the R range, and a P range position for selecting the P range of the transmission. A shift position sensor 71 generates a range signal Rs showing the selected operating range of the transmission and sends it to the controller 40, i.e., it detects the position of the shift lever 43. The shift position sensor 71 may be referred to as an inhibitor switch. Thus the range signal Rs comprises at least a drive (D) range signal, a reverse (R) range signal, a neutral (N) range signal and a parking (P) range signal.

[0025] The engaging of the forward clutch 12 and reverse clutch 13 is performed selectively. When the range signal Rs is a D range signal, the forward clutch 12 is engaged by supplying a forward clutch pressure ~~in order~~ to advance the vehicle, and the reverse clutch 13 is released by releasing the reverse clutch pressure to a drain. On the other hand, when the range signal Rs is an R range signal, the reverse clutch 13 is engaged by supplying a reverse clutch pressure to reverse the ~~vehicle while~~ vehicle, and the forward clutch 12 is released by releasing forward clutch pressure to the drain. When the range signal Rs is a N range signal or a P range signal, both the

forward clutch 12 and reverse clutch 13 are released by releasing forward clutch pressure and reverse clutch pressure to the drain.

Please replace ¶¶ **[0027]-[0030]** with the following:

[0027] The primary pulley 21 is a pulley on the input shaft side into which the torque from the engine 60 is inputted. The primary pulley 21 is provided with a fixed conical plate ~~21a which~~ 21a, which rotates together with an input shaft 21c, and a movable conical plate ~~21b facing this~~ 21b, which faces the fixed conical plate 21a and ~~forming~~ thereby forms a V-shaped pulley groove with the fixed conical plate 21a. The movable conical plate 21b is free to displace in an axial direction due to an oil pressure (henceforth, "primary pressure") ~~which~~ that acts on the primary pulley. The rotation speed N1 of the primary pulley 21 is detected by a primary pulley rotation speed sensor 41.

[0028] The secondary pulley 22 transmits the torque transmitted by the V belt 23 to the drive wheel 70 via an idler gear or a differential gear. The secondary pulley 22 is provided with a fixed conical plate ~~22a which~~ 22a, which rotates together with the output shaft 22c, and a movable conical plate ~~22b which~~ 22b, which is free to displace in an axial direction according to an oil pressure (henceforth, "secondary pressure") ~~which~~ that acts on the secondary pulley. The movable conical plate 22b faces the fixed conical plate 22a, ~~and it forms~~ thereby forming a V-shaped pulley groove with the fixed conical plate 22a. Herein, the pressure-receiving surface area of the primary pulley and the pressure-receiving surface area of the secondary pulley are effectively equivalent. The rotation speed N2 of the secondary pulley 22 is detected by a secondary pulley rotation speed sensor 42. Herein, a vehicle speed is computed from the rotation speed of this secondary pulley 22.

[0029] The V belt 23, which is wound around the primary pulley 21 and the secondary pulley 22, ~~and transmits~~ transmits the torque ~~which~~ (that is inputted into the primary pulley 21 from the engine ~~60, to~~ 60) to the secondary pulley 22. The oil pressure adjustment part 30 is provided with an oil pump 31, a line pressure adjusting device 32, a primary pressure adjusting device 33, a secondary pressure adjusting ~~device 34~~

device 34, and a clutch pressure adjusting device 35. The oil pump 31, which is driven by the engine 60, ~~and feeds~~ feeds oil under pressure.

[0030] The line pressure adjusting device 32 adjusts the pressure of the oil supplied from the oil pump 31 to a predetermined line pressure according to a command signal (for example, duty signal etc.) from the controller 40. The predetermined line pressure is varied according to the running state of the vehicle. The primary pressure adjusting device 33 is a device ~~which~~ that controls the primary pressure, and for example comprises a solenoid or a servo link and step motor ~~which~~ that form a mechanical feedback mechanism. The secondary pressure adjusting device 34, which is controlled by a command from the controller 40, (a) further decompresses the line pressure ~~which~~ that has been adjusted by the line pressure adjusting device 32, and (b) adjusts the secondary pressure according to the running state.

Please replace ¶ **[0032]** with the following:

[0032] Based on the running state of the vehicle, the controller 40 determines the oil pressure command value, and supplies it to the clutch pressure adjusting device 35. The running state includes the vehicle speed detected by ~~a secondary~~ the secondary pulley rotation speed sensor 42, the operating range of the transmission selected by ~~selected by a~~ the shift lever 43, an accelerator pedal depression amount Da detected by an accelerator pedal sensor 73, and an engine rotation speed Ne detected by an engine rotation speed sensor 75.

Please replace ¶¶ **[0034]-[0036]** with the following:

[0034] The controller 40: (a) reads: (i) the input torque to the speed change part 20, (ii) the speed ratio, (iii) the operating range of the transmission, (vi) the vehicle speed (secondary pulley rotation speed), (v) the accelerator pedal depression amount Da, (vii) the oil temperature and oil pressure, (b) determines a target speed ratio, (c) computes target values of the primary pressure and secondary pressure for realizing

the target speed ratio, and (d) corrects the target pressure if necessary. The input torque to the speed change part 20 is calculated based on the engine rotation speed Ne. The oil temperature is detected by a temperature sensor (not shown), and the oil pressure is detected by a pressure sensor (not shown). Subsequently, the controller 40 controls the line pressure adjusting device 32, primary pressure adjusting device 33 and secondary pressure adjusting device 34 to achieve the target pressure. The line pressure adjusting device 32, primary pressure adjusting device 33 and secondary pressure adjusting device 34 adjust the oil pressure supplied to the primary pulley 21 and the secondary pulley 22. Due to this, the movable conical plate 21b and movable conical plate 22b perform an oscillating motion in the rotation axis direction, and the pulley groove width of the primary pulley 21 and the secondary pulley 22 varies. Hence, the V belt 23 moves on the primary pulley 21 and the secondary pulley 22, the contact radius of the V belt 23 with the primary pulley 21 and the secondary pulley 22 changes, and the speed ratio is controlled. Herein, the speed ratio is the ratio of the rotation speed of the primary pulley and the rotation speed of the secondary pulley.

[0035] When the accelerator pedal 44 is ~~depressed, and~~ depressed and there is a shift change in the manual mode, the controller 40 sends a command signal to the line pressure adjusting device 32, the primary pressure adjusting ~~device 33~~ device 33, and the secondary pressure adjusting device 34, causing the movable conical plate 21b of the primary pulley 21 and the movable conical plate 22b of the secondary pulley 22 to displace in an axial direction. Thereby, the contact radius with the V belt 23 changes, and the speed ratio varies continuously.

[0036] The controller 40 controls engine torque and rotation speed by controlling (a) the fuel injection amount of the engine 60, and (b) the throttle opening. ~~The torque~~ A torque converter 50 is installed between the engine 60 and forward/reverse change-over part 10, and transmits the torque of the engine 60 by the oil flow of the inside oil.

Please replace ¶¶ **[0038]-[0039]** with the following:

[0038] According to this invention, when the D range is selected after the R range as for example in R->N->D or R->D, the controller 40 commands the clutch pressure adjusting device 35 to suitably adjust the clutch pressure, and thereby prevent an increase of engaging shock ~~is prevented~~.

[0039] Also, when the R range is selected after the D range as for example in the order of D->N->R or D->R, the controller 40 commands the clutch pressure adjusting device 35 to suitably adjust the clutch pressure, and thereby prevents an increase of engaging shock ~~is prevented~~.

Please replace ¶ **[0068]** with the following:

[0068] The forward clutch 12 is connected ~~to the~~ to a forward clutch piston 12b. The forward clutch 12 is engaged with and released from the planetary gear 11 by the force of the oil pressure (pressure of forward clutch) supplied to the forward clutch piston chamber 12a, and the force of a clutch piston spring 12c. If the oil pressure supplied to the forward clutch piston chamber 12a (forward clutch pressure) is P, the pressure-receiving surface of the clutch piston 12b is Ap, the stroke amount of the clutch piston 12b with respect to a free length of the clutch piston spring ~~12c is S~~ 12c is s and the spring constant of the clutch piston spring 12c is Ks, the following relation exists: ~~P x Ap = Ks x s~~ P x Ap = Ks x s.

Please replace ¶¶ **[0071]-[0072]** with the following:

[0071] At a time t11, after the ~~select~~ shift lever 43 moves from the N range position to the D range position, precharge is performed during a time Tp(a) from a time t11 to a time t12 (FIG. 7D). After completing precharge at the time t12 and lowering oil pressure, forward clutch pressure rises gradually (FIG. 7D).

[0072] Due to this, the engaging torque increases (FIG. 7C), the rotation of ~~turbine~~ a turbine 50a of ~~a torque~~ the torque converter 50 drops, and at the time when the difference of the rotation speed of the turbine and the rotation speed of the primary pulley is zero (FIG. 7B), the engaging torque reaches a peak (FIG. 7C). The engaging torque is a frictional torque transmitted by the clutch. As there is almost no gear backlash at this time, a shock due to gear collision when the vehicle starts does not arise, and the engaging shock is small (FIG. 7A).

Please replace ¶¶ **[0075]-[0078]** with the following:

[0075] After the ~~select~~ shift lever 43 moves from the R range position to the N range position at a time t21, the oil pressure of the reverse clutch 13 gradually drops. When a predetermined time has elapsed from the time t21 (this determination is performed in the Step S19), at a time t31, the engaging torque of the reverse clutch 13 becomes zero (FIG. 8C). This time t31 can be found beforehand by experiment. Subsequently, after the ~~select~~ shift lever 43 moves from the N range position to the D range position at a time t22, precharge is performed only during a time Tp(a) from the time t22 to the time t23 (Step S211).

[0076] When precharge has been completed at the time t23, a low clutch pressure is applied until a time t24 (Step S212). This clutch pressure is a little higher than the pressure ~~(Ks x s / Ap)~~ (Ks x s / Ap), which balances the force with which the clutch piston spring 12c pushes the clutch piston, ~~and it~~ and which is lower than the initial precharge pressure Pi. By setting the clutch pressure in this way, the forward clutch 12 gradually engages with the planetary gear 11. The time period ~~t23-t24~~ t23-t24, which is a period when the power train is gradually rotating forwards and backlash disappears, ~~and is~~ is set beforehand based on the size of the power train. The time period t23-t24 corresponds to the predetermined time period in the Step S213. After the time t24, the forward clutch pressure rises rapidly (Step S214).

[0077] As shown by the continuous line of FIG. 8A, ~~to control~~ by controlling the clutch pressure as previously described ~~above~~, the engaging shock is suppressed (i.e., the engaging shock is small). In contrast, if, ~~as described above. If,~~ after terminating precharge at the time t23, oil pressure is applied as shown by the dashed line of FIG.

~~8D without~~ 8D, without taking the backlash of the power train into consideration, the engaging torque rises considerably as shown by the dashed line of FIG. 8C, such that ~~and the~~ engaging shock is large (dashed line of FIG. 8A).

[0078] ~~However, in~~ In this embodiment, however, a low clutch pressure is applied from the time t23 to t24 until the backlash of the power train disappears (continuous line of FIG. 8D), so the forward clutch 12 is gradually engaged with the planetary gear 11. Thus, the increase amount of engaging torque can be ~~suppressed low~~ suppressed (continuous line of FIG. 8C). Also, after the engaging torque increases at the time t32, the clutch pressure is sharply increased, so the clutch can be engaged while suppressing the engaging ~~shock small~~ shock (continuous line of FIG. 8A). As shown by the continuous line of FIG. 8C, the rotation of the turbine 50a of the torque converter 50 ~~falls, and~~ falls; the engaging torque reaches a peak at a ~~time t33~~ time t33, when the difference of the rotation speed of the turbine and the rotation speed of the primary pulley becomes zero (FIG. 8B).

Please replace ¶¶ **[0081]-[0083]** with the following:

[0081] If the D range is directly selected from the R range at a time t41, precharge will be performed only during a time Tp(a) from the time t41 to a time t42 (Step S201). After precharge is completed at the time t42, a low clutch pressure is applied until a time t43 (Step S202-S203). During the period t42 to t43, the gears of the power train gradually rotate forward, and backlash is lost. During this period, the oil pressure of the reverse clutch 13 has fallen off to zero, and a state ~~where~~ of interlock does not ~~arise, obtains~~ arise at a time t51. The period t42 to t43 is set beforehand based on the size of the power train, etc. During this period, the clutch pressure is a little higher than the pressure ~~(Ks x s / Ap)~~ (Ks x s / Ap), which balances the force with which the clutch piston spring 12c pushes the clutch piston, and which is a lower pressure than the initial precharge pressure. In this way, the forward clutch 12 is gradually engaged with the planetary gear 11. After the time t43, the forward clutch pressure rises sharply (Step S204).

[0082] As shown by the continuous line of FIG. 9A, the control of clutch pressure suppresses an engaging shock ~~small~~, as previously described ~~above~~. If, after

terminating precharge at the time t42, the oil pressure of the forward clutch 12 is raised rapidly before dropping the pressure of the reverse clutch 13 (before a time t51) as shown by the dashed line of FIG. ~~9D without~~ 9D, without taking into consideration whether or not the oil pressure of the reverse clutch 13 has fallen off, the oil pressure will rise considerably as shown by the dashed line of FIG. ~~9C, and~~ 9C and the engaging shock will be large as shown by the dashed line of FIG. 9A. For a moment, ~~it will be in~~ an interlock state (state wherein the forward clutch 12 and reverse clutch 13 are both engaged with the planetary gear 11) will occur. After the interlock state, if the reverse clutch 13 is released, the engaging shock of the forward clutch 12 will be large.

[0083] In this embodiment, a low clutch pressure is applied from the time t42 to t43 until the oil pressure of the reverse clutch 13 has fallen off to zero so that an interlock does not occur, while the power train gradually rotates forward and backlash is eliminated, as shown by the continuous line of FIG. 9D ~~shows~~. For this reason, the forward clutch 12 gradually engages with the planetary gear 11, and the increase amount of engaging torque can be ~~suppressed low~~ suppressed, as shown by the continuous line of FIG. 9C. After the engaging torque has increased at the time t52, the clutch pressure can be increased at a large increase rate, so that clutch engaging can be ~~performed~~ performed, while suppressing the engaging shock ~~small~~, as shown by the continuous line of FIG. 9A.

Please replace ¶¶ **[0085]-[0086]** with the following:

[0085] As described above, when the reverse range is first selected and the neutral range is then selected, followed by the drive ~~a drive~~ range ~~is selected~~, and when the time for which the neutral range was selected is more than sufficient for the oil pressure supplied to the reverse clutch 13 to decrease to zero, oil pressure is supplied to the forward clutch 12 to perform ~~precharge~~ precharge, which raises it to the initial ~~pressure, and~~ pressure; then an oil pressure less than the initial pressure is supplied. Subsequently, the oil pressure is increased rapidly after a time has elapsed, until the power train performs forward rotation and backlash stops ~~, has elapsed~~. Due to this, the oil pressure can be raised in steps, the engaging shock when the vehicle

advances can be suppressed ~~small~~. Similarly an engaging shock is not produced also during reverse. ~~Since~~ As the predetermined time period is set based on the size of the power train, it can be set to a suitable time without using a sensor.

[0086] When the range is selected by the shift lever 43 in the order R range ->N range ->D range, and when the time for which the neutral range was selected is less than sufficient ~~time for~~ for the pressure supplied to the reverse clutch 13 to decrease to zero, after performing ~~precharge~~ precharge, which supplies oil pressure to the forward clutch 12 to raise it to the initial pressure Pi, the oil pressure is decreased to the predetermined oil pressure ~~P1, and~~ P1; after a predetermined time period has ~~elapsed~~ elapsed, until backlash is eliminated, the oil pressure is increased at a small increase rate. Hence, the oil pressure can be raised gradually, and the engaging shock due to backlash when the vehicle advances can be suppressed ~~small~~. Similarly, an engaging shock is not produced when the range is selected by the shift lever 43 in the order D range ->N range ->R range.